

Five New Species of Ferns from the American Tropics

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ABSTRACT. Five new species of ferns, *Blechnum anthracinum*, *B. werffii*, *Saccoloma squamosum*, *Polypodium pinnatissimum*, and *Tectaria pubens*, are described as a result of work on general fern identification at MO and for the pteridophyte volume of *Flora Mesoamericana*.

Blechnum anthracinum R. C. Moran, sp. nov.

TYPE: Bolivia. La Paz: Provincia de Nor Yungas, Cotapata, roadside behind gas station, 16°15'S, 67°50'W, 3,225 m, 27 July 1989, Fay & Fay 2446 (holotype, MO; isotypes, LPB not seen, UC, US). Figure 1.

Plantae epiphyticae. Rhizoma 5–12 mm latum, anthracinum, reptans, internodiis 5–15 mm longis, stolonifera, stolonibus ca. 1 mm longis, anthracinis, squamis rhizomatis 3–6 mm longis, 1–2 mm latis, lanceolatis, anthracinis, denticulatis. Folia sterilia et fertilia monomorphica, petiolis 20–70 cm longis, ad basim anthracinis, ad apicem stramineis vel brunneis, omnino dense squamulosis, squamis 0.5–1 mm longis, adpressis, ciliatis rubrobrunneis, caducis. Laminae 20–55 cm longae, 6–13 cm latae, anguste lanceolatae, 30–55-jugatae, omnino 1-pinnatae, pinnis 3–6.5 cm longis, 0.5–1 cm latis, falcatis, basi valde cordatis auriculis rhachidi superpositis, ad basim foliorum valde reflexis, supra sparse et infra modice squamulosis, squamis valde denticulatis vel dissectis. Rhachis dense squamulosa, squamis rubrobrunneis, denticulatis, denticulis apice interdum bifurcatis.

Plants epiphytic; rhizome 5–12 mm wide, black, shiny, creeping, with internodes 5–15 mm long, stoloniferous, the stolons ca. 1 mm wide, black, shiny; rhizome scales 3–6 × 1–2 mm, lanceolate, blackish, denticulate; sterile and fertile leaves monomorphous; petioles 20–70 cm long, blackish basally, stramineous to brown distally, densely scaly throughout, with the scales 0.5–1 mm long, appressed, ciliate, reddish brown, caducous; lamina 20–55 × 6–13 cm, narrowly lanceolate, 1-pinnate throughout; pinnae 3–6.5 × 0.5–1 cm, 30–55 pairs, falcate, with the base strongly cordate-auriculate, the auricles sometimes overlapping the rachis, the basal ones strongly reflexed, sparsely scaly above, moderately scaly below, with the scales strongly denticulate or highly dissected; rachis densely scaly, with the scales reddish brown, denticulate, the apex of the denticulae sometimes bifurcate.

Paratype. BOLIVIA. LA PAZ: Province of Nor Yungas, 1 km W of Chuspata, elfin forest with *Clusia*, *Wein-*

mannia, and *Myrica*, 16°17'S, 67°49'W, 3,140 m, *Solomon* 7259 (MO).

Blechnum anthracinum grows in cloud forests in Bolivia, from 3,140 to 3,225 m. No other species of *Blechnum* with monomorphic sterile and fertile leaves grows at such high elevations or is epiphytic. Several characteristics of this species readily distinguish it from other monomorphic *Blechnum* species. The rhizome and stolons are black and shiny (thus the specific epithet). In leaf cutting, the pinnae are short-stalked or sessile throughout the length of the lamina (rather than adnate and confluent distally). The basal pinnae are strongly reflexed. The pinnae are more numerous (30–55 pairs) compared to closely related species such as *B. occidentale* L. (12–25 pairs) or *B. glandulosum* Kaulf. (19–40 pairs). The scales on all parts of *B. anthracinum* are strongly denticulate, and those on the rachis and costae are so dense they obscure the surface. The strongly toothed scales suggest a relationship with *B. stipitellatum* (Sodirol) C. Chr., a species known from Venezuela, Ecuador, and Peru. That species, however, is terrestrial, has dimorphic sterile and fertile leaves, larger rhizome scales, dull brown rhizomes, and lacks stolons.

Blechnum werffii R. C. Moran, sp. nov. TYPE:

Panama. Chiriquí: Distrito Bugaba, Cerro Punta, around STRI house, cloud forest, rich in epiphytes, 8°52'N, 82°33'E, 2,220 m, 27 Jan. 1985, *van der Werff & Herrera* 6500 (holotype, MO). Figure 2.

Plantae terrestres. Rhizoma erectum nec subarborescens, nec stoloniferum, squamis 1–1.5 cm longis, 0.2–0.3 cm latis, ovatis vel lanceolatis, concoloribus, pallide flavobrunneis, integris. Folia sterilia et fertilia dimorpha. Folia sterilia 17–41 cm longa, petiolis 8–20 cm longis, omnino atropurpureis vel pallide brunneis et maculis obscurioribus conspersis. Laminae steriles 9–21 cm longae, 3–6 cm latae, 11–25-jugatae, utrinque glabrae, 1-pinnatae, versus apicem pinnatifidae et gradatim angustatae, gemmis carentibus; pinnis 1.5–3 cm longis, 0.6–1 cm latis, anguste involutis, coriaceis, serratis, sessilibus, basi cordatis, rhachidi superpositis; rhachis et costae steriles pallide brunneae (vel rhachis atropurpurea), non papillosae, glabrae vel sparsim squamosae, squamis ovatis, pallide aurantiaco brunneis, adpressis, integris; aerophora basi pinnarum praesentia, minus quam 1 mm longa, oblonga. Folia fertilia 25–57 cm longa, quam foliis sterilibus

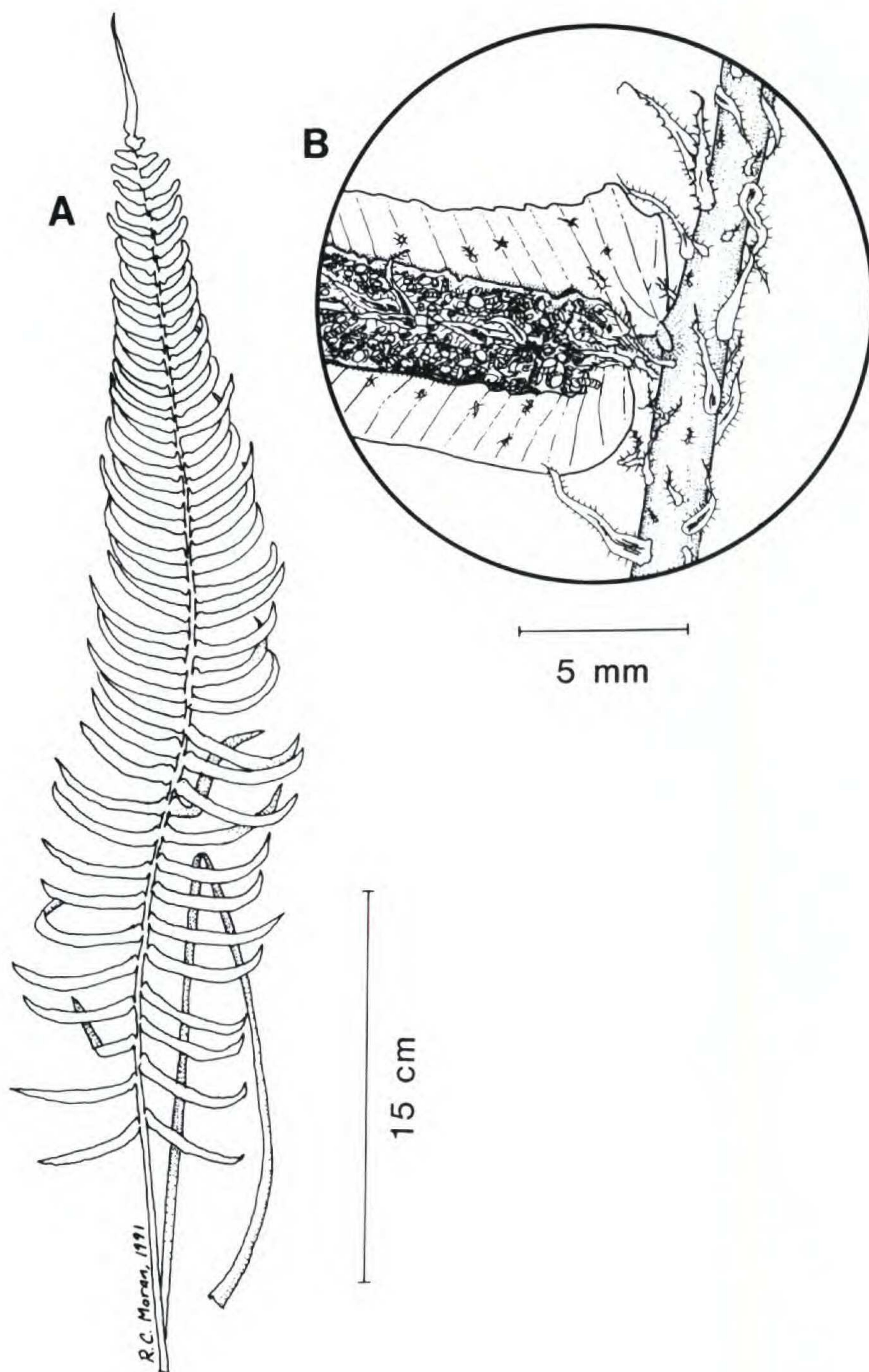


Figure 1. *Blechnum anthracinum* R. C. Moran. —A. Fertile leaf. —B. Rachis and pinna juncture. Note the slightly raised, circular aerophore on the rachis at the juncture. (Solomon 7259, MO.)

altiora, petiolis 17–35 cm longis, pallide brunneis et maculis obscurioribus conspersis, pinnis 1.2–2.5 cm longis, 0.2–0.3 cm latis.

Plants terrestrial; rhizomes erect but not subarborescent, not stoloniferous, the scales 1–1.5 × 0.2–0.3 cm, ovate to lanceolate, concolorous, light yellow-brown, entire; sterile and fertile leaves dimorphic; petioles 8–20 cm long, tan with brown spots or atropurpureous; lamina 9–21 × 3–6 cm, 1-pinnate, buds absent, the apex tapered, pinnatifid; pinnae 1.5–3 × 0.6–1 cm, pairs 11–25, narrowly involute, coriaceous, serrate, sessile, with the base cordate, overlapping the rachis; rachis and costae light tan or the rachis atropurpureous, not papillose, glabrous or sparsely scaly, the scales ovate, light

orange-brown, appressed, entire; aerophores present at the pinna bases, less than 1 mm, oblong; laminar tissue glabrous on both surfaces; fertile leaves 25–57 cm long, erect, taller than the sterile leaves; petiole 17–35 cm long, tan with brown spots or atropurpureous; pinnae 1.2–2.5 × 0.2–0.3 cm.

Paratypes. COSTA RICA. HEREDIA: on the road N of San Rafael, ca. 6 mi. above Monte de la Cruz, cloud forest, 2,000 m, *Moran 2269* (MO). PANAMA. CHIRIQUÍ: Guadalupe, Cerro Punta, Finca Alfaro, 2,000 m, *Caballero 141* (MO, PMA).

Blechnum werffii is endemic to Costa Rica and Panama, where it grows in cloud forests from 2,000 to 2,200 m. The pinnae are distinctive by being short, obtuse, coriaceous, and glabrous on both sur-

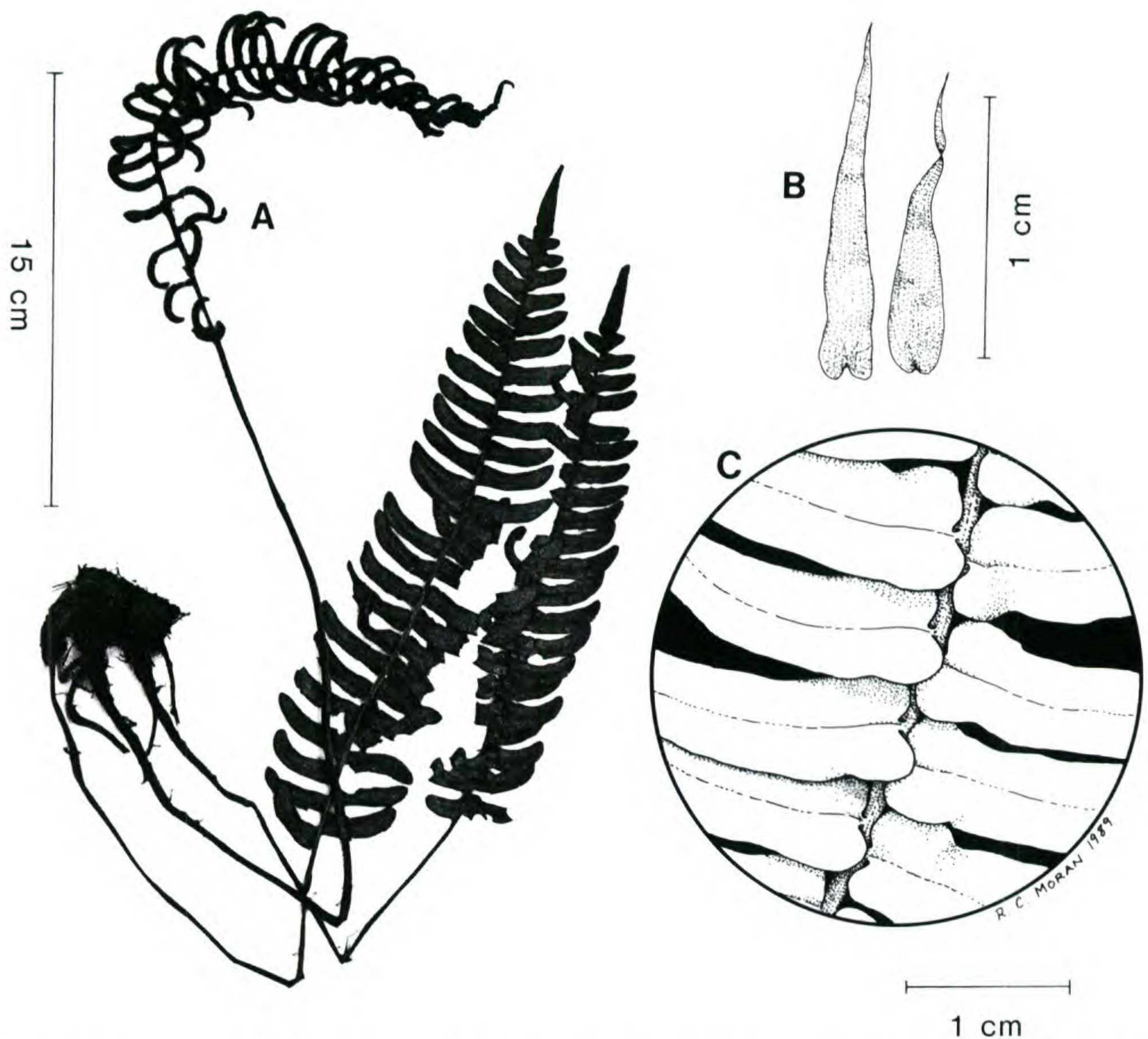


Figure 2. *Blechnum werffii* R. C. Moran. —A. Entire plant. Note the long petiole of the fertile leaf. —B. Petiole scales. —C. Pinna bases overlapping the rachis. (van der Werff & Herrera 6500, MO.)

faces. The petioles of the fertile leaves are extremely long relative to other species in the genus, being about twice the length of the fertile lamina (Fig. 2A). I cannot suggest another species of *Blechnum* that is closely related to *B. werffii*.

Saccoloma squamosum R. C. Moran, sp. nov.

TYPE: Ecuador. Zamora-Chinchi: Nangaritza Cantón, Valle del Río Nangaritza, Miazi, bosque sobre pendientes fuertes de roca caliza o de pizarra, 78°40'W, 04°18'S, 1,200 m, *Palacios 6721* (holotype, MO; isotypes, F, NY, QCNE, UC, US). Figure 3.

Plantae rheophyticae. Rhizoma erectum, squamis 0.5–1 mm latis, 0.3–0.6 mm longis, linearibus, lucidis, castaneis, denticulatis. Laminae 2-pinnato-pinnatisectae, abaxialiter dense squamosae. Sporae flavidae.

Plants rheophytic; rhizome erect; scales 0.5–1 × 0.3–0.6 mm, linear, shiny, castaneous, denticulate; petiole ca. as long as the lamina, brown, dense-

ly scaly basally, lacking epipetiolar buds; lamina 15–45 × 6–15 cm, lanceolate; pinna pairs 10–18, alternate, stalked, the stalks 0.5–1 cm long; pinnules 1.5–4 cm long, anadromically arranged throughout, slightly falcate and ascending, stalked, the stalks 1–3 mm long; rachis, costules, and veins strongly scaly abaxially, much less so adaxially, the scales 0.5–2 mm long, spreading, often tortuous, brownish, lucid, denticulate; sori ending 0.3–0.5 mm before the margin, embossed on the adaxial surface of the leaf; spores yellowish.

Paratype. ECUADOR. ZAMORA-CHINCHIPE: Nangaritza Cantón, Valle del Río Nangaritza, Miazi, bosque sobre pendientes fuertes de roca caliza o de pizarra, 78°40'W, 04°18'S, 1,200 m, *Palacios 6737* (AAU, F, MO, QCNE).

Saccoloma squamosum most resembles *S. inaequale* (Kunze) Mett., which probably represents a complex of several species. *Saccoloma squamosum* differs from all its congeners by its densely scaly leaves, smaller leaf length, and linear, dentic-

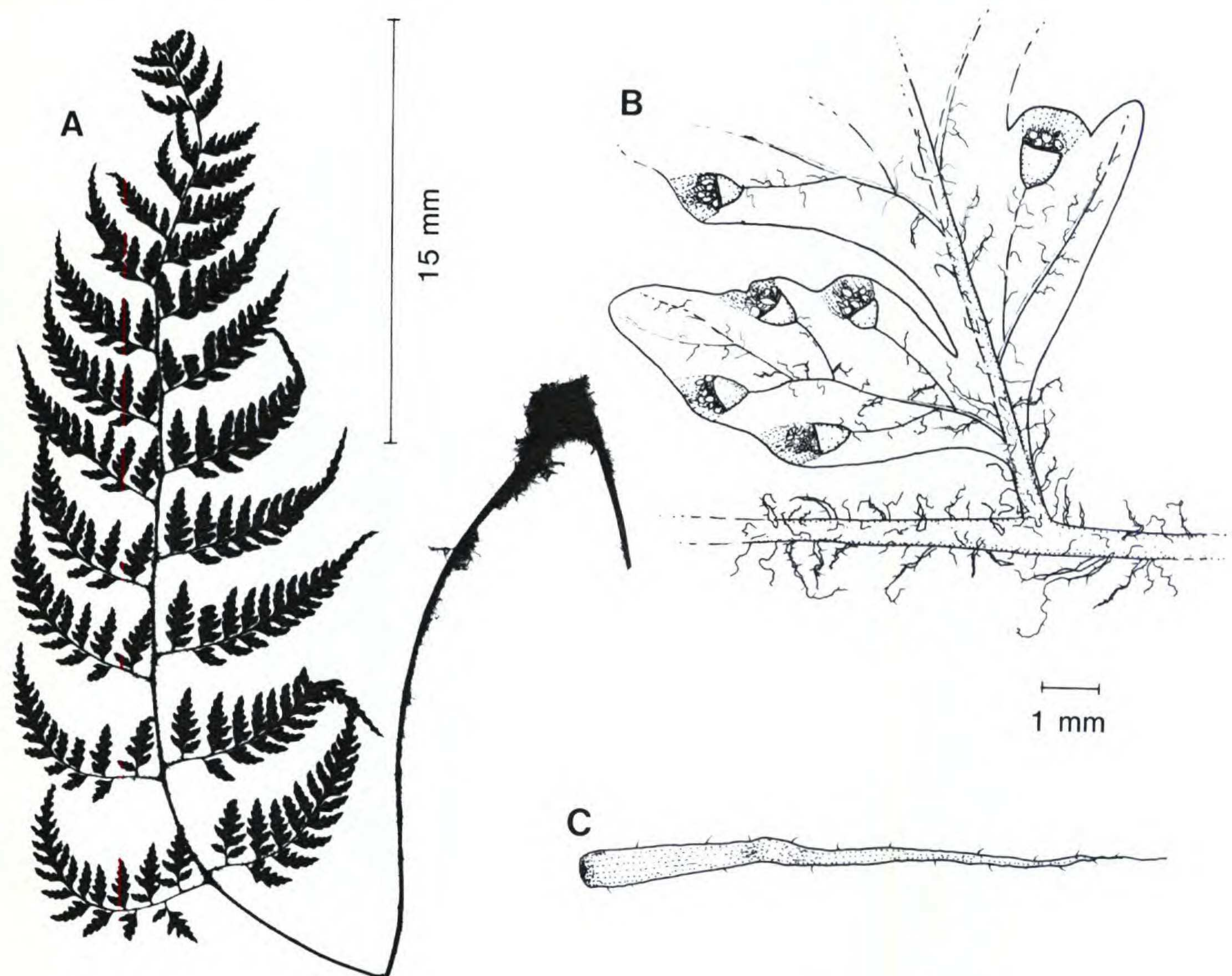


Figure 3. *Saccoloma squamosum* R. C. Moran. —A. Fertile leaf. —B. Pinnule base showing the strongly scaly axes and veins. —C. Rhizome scale. (*Palacios 6721*, UC.)

ulate, castaneous rhizome scales. Whereas all other neotropical species of *Saccoloma* are terrestrial, *S. squamosum* is a rheophyte. The valley where the specimens were collected is unusual geologically because of its vast limestone and slate outcrops. It may eventually be shown that *S. squamosum* is restricted to these rock types.

Saccoloma was reviewed by Tryon (1962), who recognized three species in the American tropics (i.e., *S. domingense* (Sprengel) C. Chr., *S. elegans* Kaulf., *S. inaequale* (Kunze) Mett.). Since then, the number of taxa has doubled from the addition of *S. membranaceum* Mickel, *S. elegans* subsp. *charitaceum* Nair ex Cremers & Kramer, and *S. squamosum*.

Polypodium pinnatissimum R. C. Moran, sp. nov. TYPE: Panama. Panamá–San Blas border: along El Llano–Cartí road, ridge trail along the divide, wet forest, 09°20'N, 78°58'W, 250–300 m, *Moran 4098* (holotype, MO; isotype, UC). Figure 4.

Plantae epiphyticae. Rhizoma 5–8 mm latum, repens, squamis 2–5 mm longis, 1–1.5 mm latis, ovatis, concoloribus, brunneis, non clathratis, integris, adpressis, pubescentibus. Laminae (15–)25–40 cm longae, (6–)20–30 cm latae, 1-pinnatae, apice conforme vel hastato, pinnis (3–)10–15 cm longis, 0.8–1.9 cm latis, integris, 8–16 utroque rhachidis latere; rhachis adaxialiter pubescens; venae liberae; sporangia setulosa.

Plants epiphytic; rhizome 5–8 mm wide, not pruinose, creeping, the scales 2–5 × 1–1.5 mm, ovate, brown, concolorous, not clathrate, entire, appressed, usually comose basally with brown hairs at the point of attachment; petiole ca. ½ the length of the lamina, brown, sparsely puberulent abaxially, exalate; laminae (15–)25–40 × (6–)20–30 cm, deltate, 1-pinnate throughout, not reduced basally, abruptly reduced distally to a hastate or subconform terminal segment; pinnae (3–)10–15 × 0.8–1.9 cm, entire, pairs 8–16, opposite or subopposite and sessile in the basal part of the lamina, becoming adnate and alternate distally; rachis brown, pubescent adaxially, the hairs 0.2–0.3 mm long, 2–4-celled, antrorse;

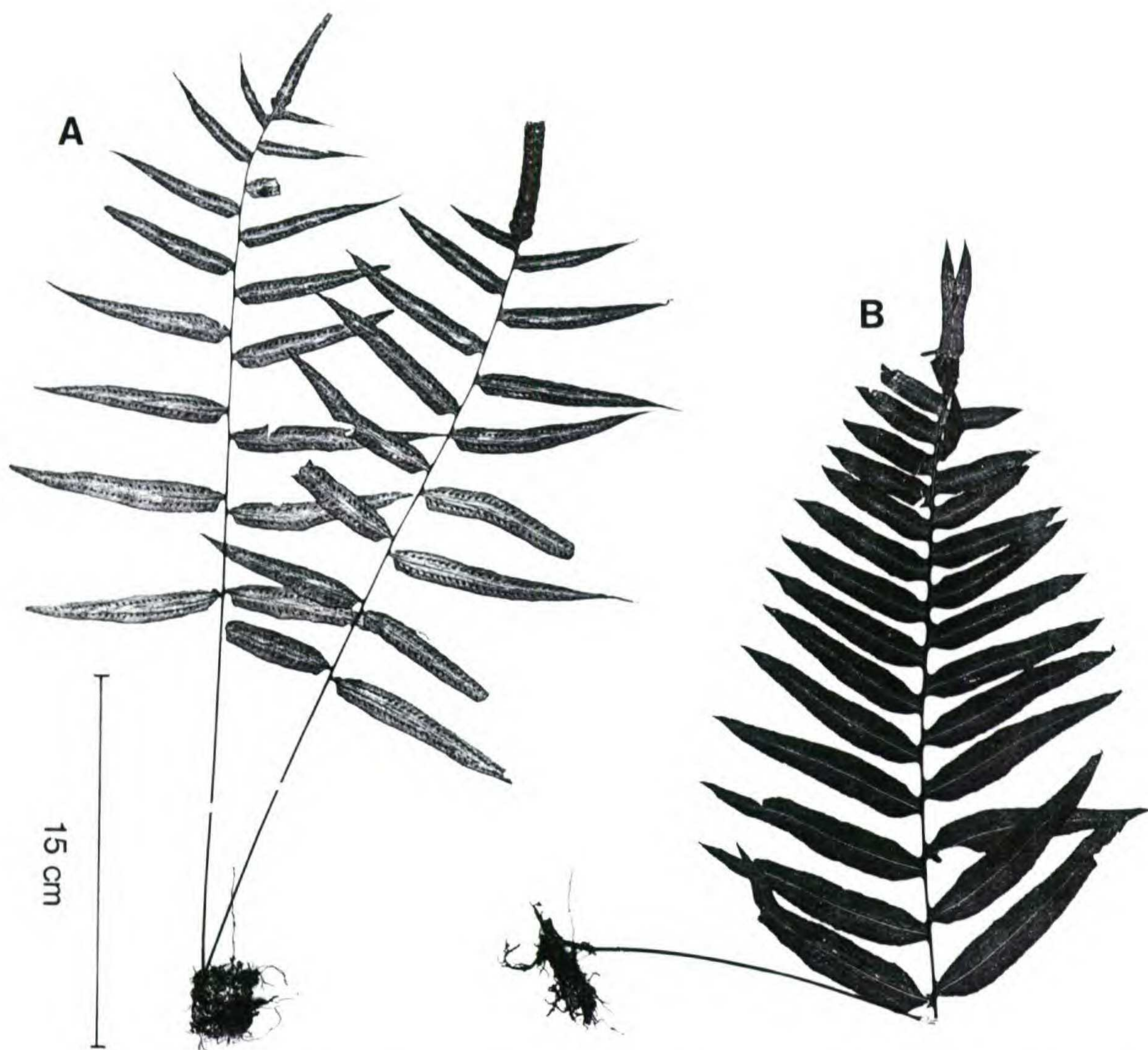


Figure 4. —A. Fertile leaf of *Polypodium pinnatissimum* R. C. Moran (*van der Werff* 7027, MO). —B. Fertile leaf of *P. dulce* Poiret in Lam. (*Moran* 3198, MO).

costae mostly whitish or brown basally, sparsely pubescent abaxially, the hairs ca. 0.1 mm long, occasionally branched, very pale reddish or brownish, moderately pubescent adaxially, the hairs ca. 0.2 mm long, antrorse, 2–4-celled; veins free; laminar tissue between the veins glabrous on both surfaces; sori round to elliptic, in one row between the costa and margin; sporangia setulose, the setulae ca. 0.1 mm.

Paratypes. COSTA RICA. ALAJUELA: Finca Los Ensayos, ca. 11 mi. NW of Zarcero, 900 m, *Croat* 43509 (MO, UC), 43512 (MO). SAN JOSÉ: Reserva Biológica Carara, W part of Montañas Jamaica, ca. 3.5 km NE of Bijagual de Turubares, 9°45.5'N, 84°33.5'W, 500–600 m, *Grayum* 8582 (MO); Zona Protectora La Cangreja, along Quebrada Grande and on adjacent ridges, ca. 2 km NNE of Mastatal de Puriscal, 9°42'N, 84°22'W, 400–540 m, *Grayum* 8636 (MO, UC). PANAMA. COCLÉ: along road between Llano Grande and Coclesito (N of Pintada), 4 mi. N of Llano Grande, 600 m, *Antonio* 3577 (MO); La Mesa, above El Valle, 800 m, *Croat* 25340 (MO); road from La Pintada to Coclesito, 80°30'W, 8°45'N, 600 m, *Hamilton & Davidse* 2845 (MO, UC); S of Cascajal along Continental Divide, 8°45'N, 80°25'W, 800–900

m, *Knapp* 1989 (CR, MO, UC), 1991 (MO); ca. 3 km NE of El Valle, *Mori & Kallunki* 2973 (MO); foot of Cerro Pilon, above El Valle de Antón, ca. 600 m, *Porter et al.* 4616 (MO); W slope and summit of Cerro Valle Chiquito, 700–800 m, *Seibert* 510 (MO). COLÓN: Santa Rita Ridge, end of road from Transisthmian Hwy., ca. 10 mi. from hwy., *Porter et al.* 4829 (MO). HERRERA: 18 km W of Las Minas, trail to top of Alto Higo, 800 m, *Hammel* 4220 (CR, MO). PANAMÁ: Cerro Campana, near summit, 1,000 m, *Croat* 22805 (MO), 12149 (MO), *Kennedy et al.* 2055 (MO), *Porter et al.* 4880 (MO), *Sytsma* 3528 (MO), *van der Werff & Herrera* 6204 (MO, UC). PANAMÁ/SAN BLAS: Nusagandi, *van der Werff* 7027 (MO, UC). SAN BLAS: road from El Llano to Cartí, Pacific side, 79°00'W, 9°20'N, 200–300 m, *Hamilton & Stockwell* 2936 (MO, UC); Campamento Nusagandi, sendero Ina Igar en el Llano–Cartí, 19 km de la Vía Interamericana, 350–400 m, *Herrera & Irvine* 352 (MO, UC, US). VERAGUAS: 5 mi. W of Santa Fé on road past Escuela Agrícola, Alto Piedra, on Pacific side of divide, 800–1,200 m, *Croat* 23058 (MO).

Polypodium pinnatissimum is closely related to *P. dulce* Poiret in Lam. (a species that has previously been called *P. sororium* Humb., Bonpl. & Willd.;

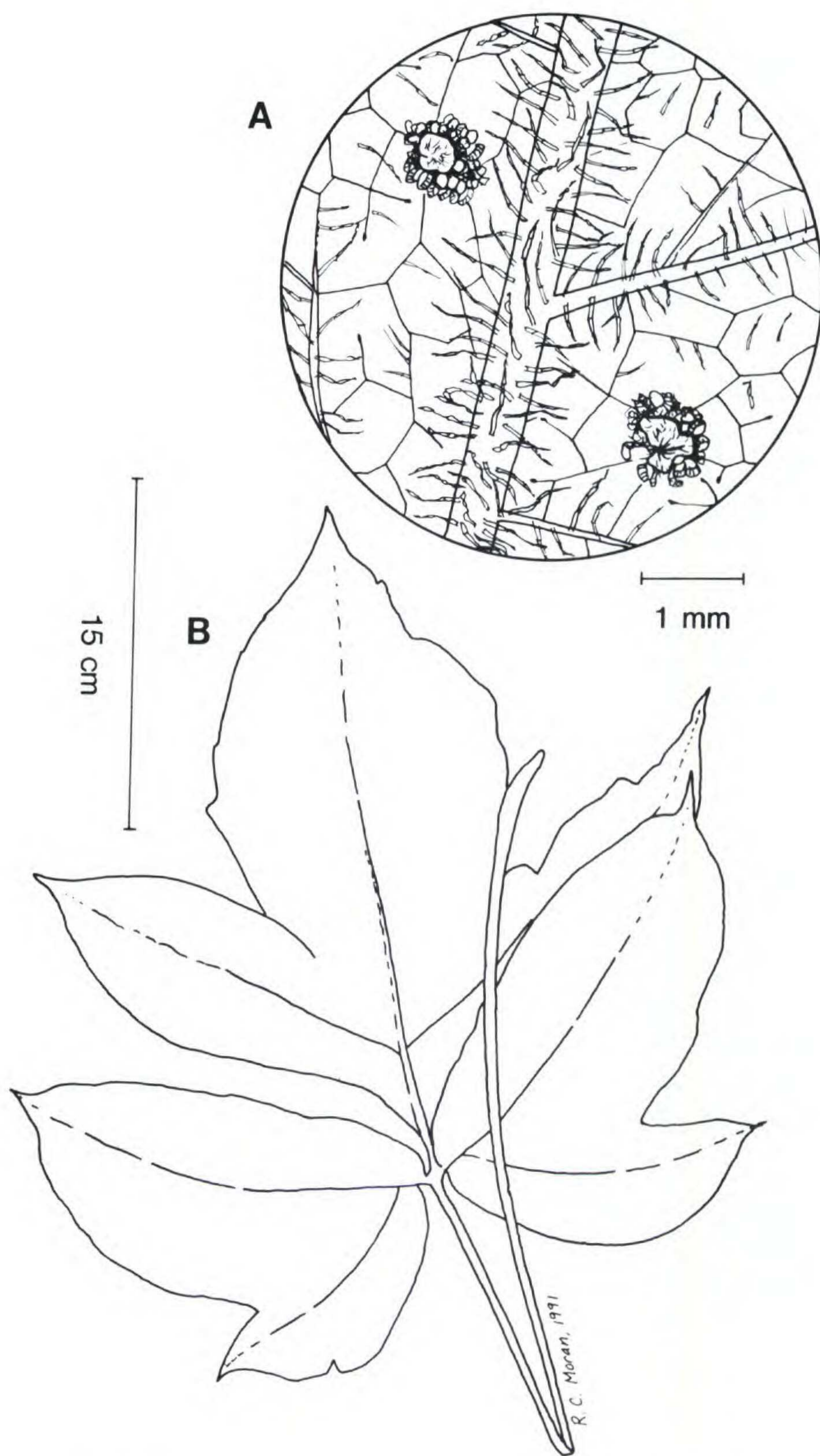


Figure 5. *Tectaria pubens* R. C. Moran. —A. close-up of the abaxial surface of the leaf, showing dense pubescence of long, septate hairs. —B. Sterile leaf. (Moran 3647, MO.)

Proctor & Lourteig, 1990). Both have free veins, similarly cut laminae, and round to elliptic sori. *Polypodium pinnatissimum* differs by its completely 1-pinnate lamina (Fig. 4A) and setulose sporangia. In contrast, *P. dulce* has mostly pinnatisect laminae (or 1-pinnate basally; Fig. 4B) and glabrous sporangia. Three other differences occur between the species, but these are not constant: *P. pinnatissimum* tends to have less visible veins, narrower (0.8–1.9 cm wide) pinnae, and hastate or subconform

apices. In contrast, *P. dulce* often has darkened and easily visible veins (especially adaxially), wider (0.9–2.5 cm wide) pinnae, and more or less evenly tapered, pinnatifid apices. The two species also differ in range: *P. pinnatissimum* occurs in Costa Rica and Panama, whereas *P. dulce* occurs from southern Mexico to western Panama (Chiriquí), Venezuela, Colombia, Ecuador, and Peru. Most of the specimens of *P. pinnatissimum* are from Panama, where *P. dulce* is rare.

Tectaria pubens R. C. Moran, sp. nov. TYPE: Peru. Loreto: Prov. Maynas, ca. 50 mi. downriver from Iquitos, at Peter Jensen's Explorama Lodge, virgin forest, clay soils, ca. 120 m, *Moran 3647* (holotype, MO; isotype, UC). Figure 5.

Plantae terrestres. Rhizoma erectum vel decumbens, squamis 5–10 mm longis, lanceolatis, brunneis, integris. Petioli 40–60 cm longi, pubentes. Laminae 35–50 cm longae, late ovatae, 1-pinnatae, gemmis carentes, pubentes, pilis 0.4–1 mm longis, 5–8-cellularibus rufis praeditae; pinnae basales 10–16 cm latae, falcatae, acuminatae, ad basim basiscopice lobatae. Indusia reniformia vel circularia, pubescentia.

Plants terrestrial; rhizome erect or decumbent, the scales 5–10 mm long, lanceolate, dull brown, entire; lamina 35–50 cm long, broadly ovate, 1-pinnate, lacking buds; basal pinnae 10–16 cm wide, free with a short stalk up to 3 mm long, falcate, acuminate, entire except for a single basal basiscopic lobe; medial segment 20–30 × 8–12 cm, opposite, falcate, entire, acuminate, decurrent; terminal segment ovate, with one or two shallow lobes; rachis and costae abaxially densely pubescent (the surface often obscured); costules and veins pubescent abaxially, the hairs 0.4–1 mm long, 5–8-celled, pale reddish with most of the color aggregated in the septae, the cells often flattened, adaxially glabrous to sparsely pubescent; laminar tissue between the veins pubescent abaxially, glabrous adaxially; sori in 2(–4) rows between the main veins; indusia reniform to circular, persistent, brown, concolorous, pubescent on the surface and margins, the hairs ca. 0.1 mm long.

Paratypes. ECUADOR. NAPO: Jatun Sacha Biological Station, 8 km E of Misahuallí, 1°04'S, 77°36'W, 400 m, *Fay & Fay 2714* (F, MO, QCNE). PASTAZA: Vía Auca, 115 km al S de Coca, 10 km al S de la frontera Napo–Pastaza, cerca del Río Tiguino, carretera de PETROCANADA en construcción, bosque húmedo tropical, lomas del suelo rojo, 01°15'S, 76°55'W, 320 m, *Hurtado & Neill 1486* (MO). PERU. LORETO: Prov. Maynas, Yanamono Explorama Tourist Camp, halfway between Indiana and mouth of the Río Napo, nonflooded forest on rather fertile soil, 130 m, *van der Werff et al. 9886* (MO), *Gentry 29142* (MO, UC).

Tectaria pubens most closely resembles *T. pilosa* because of its pubescent laminae and similar leaf cutting. However, *T. pubens* has pinnae 10–16 cm wide, long-decurrent apical segments, and one pair of free basal pinnae. In contrast, *T. pilosa* has pinnae 2–5 cm wide, cuneate or short-decurrent apical segments, and 1–4 pairs of free pinnae.

Tectaria pilosa (Fée) R. C. Moran, comb. nov.
Basionym: *Cardiochlaena pilosa* Fée, *Mém. Foug.* 10: 45, t. 40, f. 4. 1866. TYPE: Brazil. Rio de Janeiro: *Weddell 656* (P? not seen).

This species has been previously identified in herbaria as *Tectaria incisa* Cav. var. *pilosa* (Fée) C. Morton. It is here recognized at the specific level because the plants are morphologically distinct and do not intergrade with related species. In Costa Rica and Panama, *T. pilosa* grows commonly in lowland forests with *T. incisa* Cav. and *T. vivipara* Jermy & T. Walker. I have not seen intermediates that might be interpreted as hybrids between these species. From a distance, *T. pilosa* can be distinguished from the other two by its smaller leaves, lighter green laminae, and fewer (1–4) pairs of pinnae. The other species have leaves about twice as long, darker green laminae, and more numerous (4–12) pairs of pinnae. Closer examination of *T. pilosa* reveals that both surfaces of the lamina are pilose with spreading, septate hairs 0.2–0.8 mm long. In contrast, both *T. incisa* and *T. vivipara* are glabrous (except on the axes). Fée's illustration of the type appears to match the Mesoamerican plants in cutting of the lamina and abundance of long hairs.

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